Ciprofloxacin and Ceftriaxone Resistance among Human Non-Typhoidal *Salmonella* in the United States; 1996-2001

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Each year, an estimated 1.4 million *Salmonella* infections occur in the United States; most are acquired from eating foods of animal origin. Fluoroquinolones and third generation cephalosporins (e.g., ceftriaxone) are commonly used for treating *Salmonella* infections. Fluoroquinolones and third generation cephalosporins (e.g., ceftiofur) also are used in food animals. Among *Salmonella*, cross-resistance occurs among fluoroquinolones and between ceftiofur and ceftriaxone.

Public health laboratories in the National Antimicrobial Resistance Monitoring System (NARMS) forward every tenth non-typhoidal *Salmonella* isolate from humans to CDC for susceptibility testing by Sensititre®. In 1996-1998, isolates with decreased susceptibility to ceftriaxone (MIC $\geq$ 16 µg/ml) were additionally tested by E-test. In 1999-2001, isolates with decreased susceptibility to ceftiofur (MIC $\geq$ µg/ml) and/or decreased susceptibility to ceftriaxone (MIC $\geq$ 4 µg/ml) were additionally tested by by-hand broth microdilution.

From 1996-2001, 10 (0.1%) of 8387 non-typhoidal *Salmonella* isolates were ciprofloxacin resistant; resistant isolates were serotype Senftenberg, Schwarzengrund, Indiana, and Typhimurium. From 1996-2001, 109 (1.3%) of 8387 isolates were ceftriaxone resistant; resistant isolates were serotype Newport, Typhimurium, Agona, Enteritidis, Cubana, Heidelberg, Matopeni, Skansas, Thompson, and Worthington. The percent ceftriaxone-resistant was 0.1% in 1996 and 2.4% in 2001.

Fluoroquinolone and ceftriaxone resistance are increasingly being recognized in non-typhoidal *Salmonella*. Controlling the emergence and spread of antimicrobial-resistant *Salmonella* will require efforts to encourage appropriate use of antimicrobial agents.

Suggested citation:

Baker N, Angulo F, Joyce K, Stevenson J, McClellan J, Whichard J, Gay K, Barrett T, and the NARMS Working Group. Ciprofloxacin and Ceftriaxone Resistance among Human Non-Thphoidal *Salmonella* in the United States; 1996-2001. National Antimicrobial Resistance Monitoring System. Annual Scientific Meeting. November 19-22, 2002. Hilton Head, SC.